

## THE GREAT SECOND TYPE OF CHRONIC ARTHRITIS—FURTHER STUDIES

By LEONARD W. ELY, M. D., San Francisco

**General.** By the term second type of arthritis I mean that great type of chronic arthritis called arthritis deformans by the Germans, osteoarthritis by the English, degenerative arthritis by Nichols and Richardson, hypertrophic arthritis by Goldthwait, and other names by various other writers. My reasons for my nomenclature have been set forth on numerous occasions in previous papers, as well as the objections to the titles hitherto given to the disease.<sup>1</sup> The term destructive arthritis is being employed recently with increasing frequency, especially by radiographers, but as this term can be employed with equal justice to every known form of arthritis, it can be said to be worse than most of the others.

One year ago I reported ninety cases of the disease, setting forth its essential features.<sup>2</sup> I shall recapitulate briefly here.

The prime cause is infection in the alveolar processes of the jaws. Trauma only acts by straining a joint already damaged by the disease.

The disease is essentially one of middle life and of advanced age, but only because alveolar infection is more frequent then. It occurs fairly often in the third decade. Diet is only of importance from the fact that indigestion changes the secretions of the mouth, and makes the infection about the roots of the teeth more active. All attempts to understand the disease on the basis of "disturbed metabolism" or to treat it on that basis are futile. The changes have been rung *ad nauseam* on the dietary treatment of chronic arthritis, or chronic rheumatism as it was formerly caused. The pendulum swings back and forth. The present vogue of the "carbo-hydrate free" diet is simply a recrudescence of the raw beef and hot water treatment, the Salisbury treatment, of forty years ago. Certain of the sufferers from this disease will improve under a starchless diet, and others under a meatless diet, simply because one diet agrees with some, and another with others. These dietary fashions are attractive, doubly so when camouflaged by high-sounding titles, and doubtless will continue to run their course. They do, however, confuse the subject and impede progress, and for this reason they should be combated. Health is metabolic equilibrium, disease is metabolic imbalance, or disturbed metabolism. To say, therefore, that a certain form of chronic arthritis is caused by disturbed metabolism, is to say that it is caused by disease, and is quite absurd.

**Pathology.** The essential primary pathological feature of the second type of arthritis is an aseptic necrosis in the bone marrow near the joint. Probably the same process occurs throughout the bone, causing cysts and fibrosis, but it usually is symptomless unless a joint is in the neighborhood.

All our efforts to obtain cultures from the marrow have been in vain. We assume that infection has been present at some time and has died out, but we know nothing as to this. The joint fluid also was always sterile in our cases, and we have come to consider the arthritis really as a traumatic arthritis, caused by the strain of function on a previously damaged and distorted machine.

Following the necrosis in the end of a long bone,\* nature builds a wall of new bone between the diseased area and the joint, and the cartilage over it degenerates and wears away, leaving an articular surface of dense, eburnated bone, which becomes grooved in the line of joint motion. New bone is built up at the circumference of the joint at the lines of attachment of the ligament, giving rise to the lipping and spurring so prominent in the radiograph and in the pathological specimen. This is the prominent gross feature of the disease, and is responsible for most of the previous ideas on it as well as for most of the names which have been applied to it. A careful study of the negative, however, usually shows distinct rarefaction in the bone near the joint, and occasionally sequestra. When the bones are sawn up in the laboratory this rarefaction is quite evident, even when the thickened bone about it disguised its presence during life.<sup>3</sup>

An observation I have made during the past year I consider very important, namely, *the relation of this disease to fracture of the neck of the femur in the elderly*. The presence of the second type of arthritis has often been noted after fracture of the femur neck, and the fracture was assumed to cause the arthritis. It cannot cause it. Cartilage and bone deprived of their nutrition and buried in the soft tissues do not behave as does the head of the femur after fracture of the neck. I speak not from abstract theory, but from knowledge gained by experimental work.<sup>4-5</sup> Marked rarefaction of the neck and head of the femur may often be seen in plates taken immediately after fracture of the femur neck too early to be caused by the fracture.

*Fracture of the neck of the femur does not cause a chronic arthritis, nor does a chronic arthritis cause the fracture; but both are caused by the same thing, namely, by a necrosis in the head and neck of the bone.*

In my article of a year ago I called attention to the influence of this disease in causing the stiff and painful joint after a joint fracture and shall not dilate upon that further here.

The ankylosis which follows this form of arthritis is that of two bones which no longer fit, the obstruction to motion is that of a damaged machine. Union of the bones, whether by fibrous tissue or bone, practically never occurs except in the spine.

1. Ely, Leonard W.—The Pathology and Classification of Chronic Joint Disease, J. A. M. A., 1912, lix, 511. Chronic Arthritis, J. A. M. A., 1913, lxi, 670. Diseases of Bones and Joints, Surg. Publ. Co., New York, 1914.
2. Ely, Leonard W.—The Second Great Type of Chronic Arthritis, Arch. Surg., 1920, i, 158.

3. Ely, Leonard W.—A Study of One Hundred Bones Sawn in the Laboratory. Bone and Joint Studies, i, Stanford University, 1916. Published by the University.

4. Cowan, John Francis and Ely, Leonard W.—A Study of Buried Bone, Jour. Orth. Surg., 1919, i, 100.

5. Ely, Leonard W.—An experimental study of Buried Bone, An. of Surg., 1919, lxx, 747.

\* The same process occurs also in short and flat bones.

Case No.	Age	Sex	Occupation	Joint	Infection
91	47	Female	Housewife	Multiple	Pyorrhea. No X-ray taken
92	55	Male	Driver for whole-sale house	Spine	Alveolar infection
93	32	Male	Laborer	Feet	Alveolar infection
94	43	Male	Ranch helper	Spine	Alveolar infection
95	72	Female	Housewife	Hip	Adentulous
96	62	Female	Domestic	Multiple	Alveolar infection
97	52	Male	Laborer	Hip	Alveolar infection
98	54	Male	Laborer	Multiple	Alveolar infection
99	63	Female	Day worker	Spine	Alveolar infection
100	67	Female	Housework	Spine	Alveolar infection
101	63	Male	Laborer	Spine	Alveolar infection
102	47	Male	Clerk	Knee	All teeth gone
103	45	Female	Housewife	Spine	Alveolar infection
104	42	Female	Nurse	Spine	Few remaining teeth sound
105	60	Female	Housewife	Hip and sacroiliac	Alveolar infection
106	55	Male	Garageman	Acromioclavicular	Alveolar infection
107	50	Male	Rigger	Knee	Alveolar infection
108	31	Female	Housewife	Knees	Alveolar infection
109	60	Female	Saleswoman	Foot	Alveolar infection
110	51	Male	Laborer	Knee	Alveolar infection
111	54	Male	Laborer	Knees	Alveolar infection
112	48	Male	Teamster	Spine	Alveolar infection
113	51	Male	Teamster	Spine	Alveolar infection
114	38	Female	Housewife	Hip	Alveolar infection
115	47	Male	Laborer	Spine	Gingivitis. No X-ray of teeth
116	63	Male	Clerk	Spine	Alveolar infection
117	62	Female	Domestic	Fingers	Alveolar infection
118	55	Male	Laborer	Knee	Alveolar infection
119	44	Male	Clerk	Tarsus	Alveolar infection
120	72	Male	Farm hand	Spine	Alveolar infection
121	51	Female	Housework	Hips	Alveolar infection
122	62	Male	Laborer	Hip	Alveolar infection
123	46	Male	Laborer	Spine	Alveolar infection
124	50	Female	Housework	Knees	Alveolar infection
125	47	Male	Mariner	Spine	Alveolar infection
126	52	Male	Laborer	Hip	All teeth out; fell out
127	63	Female	Day worker	Spine	Alveolar infection
128	55	Female	Housewife	Hip	Alveolar infection
129	59	Female	Housewife	Spine	Alveolar infection
130	48	Male	Waiter	Knee	Alveolar infection
131	67	Male	Shipjoiner	Hip	Alveolar infection
132	58	Female	Practical nurse	Multiple	Alveolar infection
133	37	Male	Laborer	Spine	Alveolar infection
134	72	Male	Laborer	Foot	Alveolar infection
135	50	Male	Laborer	Spine	Alveolar infection
136	22	Male	Confectioner	Knee	No alveolar infection
137	39	Male	Laborer	Hip	Alveolar infection
138	64	Male	Rancher	Hip	All teeth extracted
139	26	Male	Laborer	Knee	Alveolar infection
140	59	Male	Laborer	Spine	All teeth gone
141	49	Male	Carpenter	Spine	Alveolar infection
142	48	Male	Laborer	Tarsus	Alveolar infection
143	22	Male	Sailor	Knee	Alveolar infection
144	69	Female	Housework	Spine	Alveolar infection
145	56	Male	Laborer	Spine	Alveolar infection
146	39	Male	Watchman	Spine	Alveolar infection
147	52	Male	Granite cutter	Wrist	Alveolar infection
148	57	Female	Housewife	Knees	Alveolar infection
149	61	Male	Tinsmith	Spine	Alveolar infection
150	75	Male	Watchman	Spine and shoulder	Alveolar infection
151	67	Male	Laborer	Spine	Alveolar infection
152	64	Male	Laborer	Knee	Alveolar infection

**Symptomatology.** The symptoms are those of a low grade of chronic arthritis. Rarely is the pain severe except in the hip or spine. When the disease occurs in the spine it is usually called muscular rheumatism, fibrositis, lumbago, sciatica, or neuritis. Recently it has been dignified with the term radiculitis.

The diagnosis is made by the Roentgen rays. If lipping and spurring be present at the lines of attachment of the capsule, the disease belongs in this category.

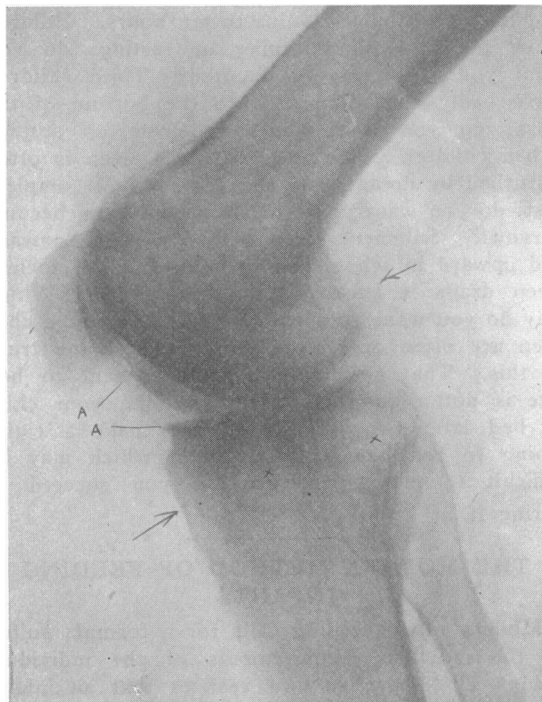
**Treatment.** The main indication is the removal of the focus of infection in the alveolar processes of the jaws, if it still exists. The changes in the joint caused by the disease, once present, never disappear, nor can they be removed. This is the reason why symptoms can persist long after all teeth are gone. Rough bone ends rubbing against each other, and masses and spikes of bone heaped up about the joint will always cause pain.

If the focus be removed in the early stages of the disease, the process may die down, and the patient may enjoy comfort thereafter. Even in

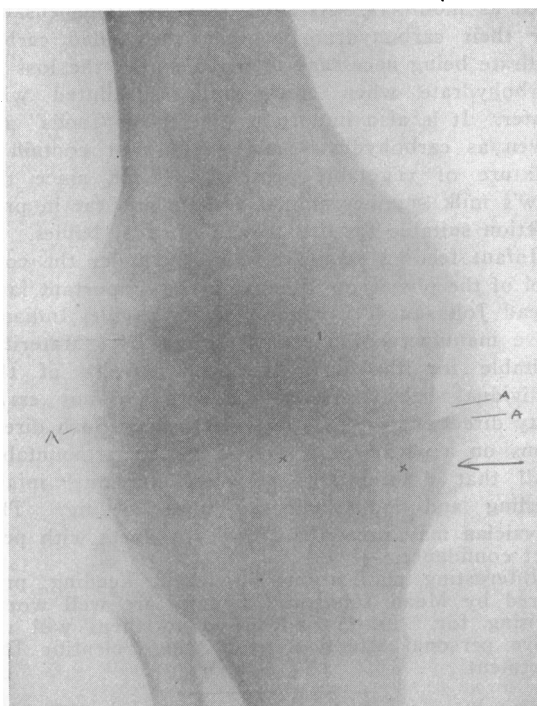
more advanced cases the removal of the focus is often followed by comparative comfort.

Immobilization probably is of little use, but heat usually is grateful. Note the tendency of elderly people with "chronic rheumatism" to hug the fire. By all means regulate the diet according to the patient's individual needs. Most of these patients learn what they may eat and what they may not. Passive hyperaemia by the Bier bandage sometimes quiets pain. Gentle massage may be tried, but forced passive motion is to be strictly avoided. It simply grinds together two rough, distorted bone ends and increases the disability. All injections into the joint I believe to be perfectly useless. Aspirin quiets the pain.

Some of our cases which have not improved after extraction of the affected teeth have done well under the deep injection of a foreign proteid. The identity of the proteid seems immaterial. My associate, Dr. Fisher, who at present has charge of this branch of the treatment, is employing anti-gonococcic vaccine, with an initial dose of 250,000,000.



Arthritis of Knee.—Skiagram showing characteristic lippling of tibia and femur (A.A.), and areas of rarefaction in head of tibia, (X.X.).



Arthritis of Knee.—Skiagram showing characteristic lippling of tibia and femur (A.A.), and areas of rarefaction in head of tibia, (X.X.).

In severe cases, especially when the hip is affected, resection offers the best way out. The head of the bone is removed, the trochanter is thrust into the acetabulum, and the hip is put up in plaster of Paris in the abducted position. The operation is difficult through the ordinary anterior incision, but easier through Sprengel's incision.

A list follows of the cases seen during the past year in the orthopaedic department of the Stanford clinics, with the sex, age and occupation of each one. My private patients present much the same results, except, of course, that the occupations are not quite so laborious as a rule.

An analysis of these cases shows conditions strikingly similar to those prevailing in the cases I published a year ago. The occupations are those of the general run of clinic patients. Some of them are laborious and some of them are not. The disease is common in well-to-do patients, but in the absence of strain often passes unnoticed unless severe.

*Sex.* Forty-two of the patients were of the male sex, twenty of the female. This may be due to two things: women may take better care of their teeth than men, or the nature of their occupations spares their joints from strain. In the latter case the presence of the disease in them passes unnoticed, or the symptoms are so slight as not to drive them to the clinic.

*Age.* This varies from twenty-two to eighty-nine, reckoned from the time of registry at the clinic. The age of onset of the disease, therefore, would run somewhat lower than the figures show. Three of the patients were in the third decade of life, five in the fourth, thirteen in the fifth, twenty in the sixth, sixteen in the seventh, four in the eighth and one in the ninth.

*Alveolar Infection.* Almost invariably this was determined by our dentist, Dr. Campbell, with the Roentgen rays. The proportion of patients with demonstrable alveolar infection was overwhelming. All but nine had it. Of these nine the *few remaining teeth* of one were sound. Two had pyorrhea, but were not radiographed. Five had lost all their teeth. In one case the teeth had "fallen out." Concerning these five it is well to remember that the pain and disability from the anatomical changes often persist long after the removal of the cause. Only one patient, a man of twenty-two, a confectioner, had sound teeth. The X-ray picture of his knee showed a marked rarefaction of the bones.

#### CONCLUSIONS

From these cases, and from those I published one year ago, the following conclusions are drawn:

1. The great second type of chronic arthritis is the result of a necrosis in the bone marrow in the region of the joint, and its distinguishing mark clinically is the production of new bone at the margin of the articulation, at the lines of insertion of the capsule.

2. No proof is at hand of the presence of infection in the bone marrow or in the joint fluid. Presumably the necrosis is due to a low-grade infection. In this case the organism itself must die out, or else is of such a nature as to escape detection with our present methods of examination.

3. This form of arthritis is more frequent in men than in women, in the proportion of two to one, at least as observed clinically. It is essentially a disease of middle and late life, though it may occur as early as twenty-two years.

4. The prime cause of the disease in an overwhelming proportion of cases is infection in the alveolar processes of the jaws. The removal of this infection is the first step in the treatment.

5. The anatomical changes are permanent. The removal of the focus of infection has no influence upon them, once they have formed.

6. The results of treatment generally are good. Removal of the focus in the alveolar processes comes first. As adjuvants, hydrotherapy, dry heat, deep injections of a foreign proteid, and, in the extremities, the application of the Bier elastic bandage may be tried.

7. In the severe form of the disease as found in the hip, resection is indicated.

8. The same aseptic necrosis in the head and neck of the femur which causes this type of arthritis in the hip is the cause of many cases, at least, of fracture of the neck of the femur in the elderly.

### Notice

If you are interested in presenting a paper at the next annual meeting in Yosemite, May 15 to 18, be sure and write *promptly* to the secretary of the appropriate section. The names and addresses of all section officers will be found on Page 419 of this number of the Journal.

Within the past few years the whole question of illegitimate births has received a great deal of attention, though generally at the hands of private organizations rather than as a State problem. Very little advance has been made in legislation pertaining to the status and support of the illegitimate child. With increased recognition of the meaning of the problem, and with the impetus that the war has given to all efforts toward conserving child life, many beneficial changes in this respect will doubtless come in the United States as in European countries. In the Federal law providing for allotments and granting allowances to the dependents of soldiers, governmental recognition was given to the equal needs of all children for proper support. Here illegitimate children were placed on the same basis with legitimate children as being entitled to support by the father and by the government. Whether or not conditions that have come since the United States entered the war, will affect the illegitimate birth rate, it is too early to determine. Regardless of whether the numbers are increased or decreased, it cannot be doubted that these children, who from the anthropological point of view are in no way inferior, but who by the conditions of their birth are in special need of protection, will, as a result of the war, become in a larger measure the special concern of the State.—(E. O. Lundberg, *Am. J. Phys. Anthropology*, July-Sept., 1918.

### SLEEP REQUIREMENTS OF CHILDREN

No child nutrition worker, says the U. S. Public Health Service, can hope to get satisfactory results without insisting on enough sleep for her charges. Besides damaging the nervous system, late hours cause "sleep hunger" and make children nervous and fidgety. The Service commends the following precepts just issued by the London County Council: School children aged four years need twelve hours' sleep a day; aged five to seven, eleven to twelve hours; eight to eleven, ten to eleven hours;

and twelve to fourteen, nine to ten hours. Children grow mainly while sleeping or resting; do you want yours to grow up stunted? Tired children learn badly and often drift to the bottom of the class; do you want yours to grow up stupid? When children go to bed late their sleep is often disturbed by dreams and they do not get complete rest; do you want yours to sleep badly and become nervous? Sufficient sleep draws a child onward and upward in school and in home life; insufficient sleep drags it backward and downward. Which way do you want your child to go? Tiresome children are often only tired children; test the truth of this. That a neighbor's child is sent to bed late is not a good reason for sending your child to bed late; two wrongs do not make a right. Going to bed late is a bad habit which may be difficult to cure; persevere till you succeed in curing it.

### THE MODERN METHOD OF FEEDING INFANTS

Modern infant feeding calls for a formula suited to the individual requirements of the individual baby. The physician now realizes that an infant, deprived of breast milk, must be fed as an individual. The nourishment from the infant's food is principally derived from cow's milk. The "foods" contain no mysterious life-giving elements, but are used as modifiers. As such, they are indispensable for their carbohydrate content, the added carbohydrate being necessary to make up for the loss of carbohydrate when cow's milk is diluted with water. It is also important that these "foods" are given as carbohydrates and should not contain a mixture of vegetable protein and fat, since the cow's milk supplies animal protein and fat in proportion suitable for the growth of most babies.

Infant feeding should be directly under the control of the physician. Realizing this important fact, Mead Johnson & Company of Evansville, Indiana, have manufactured a line of Infant Diet Materials suitable for the individual requirements of the individual baby. These products do not carry laity directions on the trade packages. Such directions on a package of food is the unsurmountable wall that differentiates between individual infant feeding and indiscriminate infant feeding. The physician may prescribe Mead's products with perfect confidence.

Interesting publications on Infant Feeding, prepared by Mead Johnson Company are well worth writing for. Letters addressed to them will receive personal attention from their Scientific Department.

### THINGS EVERY PHYSICIAN SHOULD READ

This column, which will appear from time to time in the *Journal*, is offered under the impression that much of the large and varied literature that passes over an editor's desk is not readily available to most physicians, nor have physicians time to look through the libraries for the occasional article that is really worth reading or that is an important contribution to problems confront-